REMARKS

Claims 1-6 remain pending in this application. Claims 4-6 are objected to. Claims 1-6 are rejected. No claims are cancelled herein. No new claims are added. Claims 1 and 6 are amended herein to clarify the invention. Claims 2, 3 and 5 are amended to address informalities.

Applicants respectfully submit that, upon entry of the subject amendment, the application will be in condition for allowance. Applicants, thus, respectfully request consideration of the above amendment and the following remarks.

Claim Objections

Claims 4-6 are objected to as being in improper form because a multiple dependent claim cannot depend from another multiple dependent claim. Applicants acknowledge that the Examiner agreed to withdraw such objections, as such dependency was corrected previously in the preliminary amendment.

Subject Matter of Applicants' Inventions

Applicants' claim an analyzer in which correlation coefficients among multiple time series signals providing inputs for use in controlling engine performance are analyzed not just for signals in a steady state, but also for at least one time series signal in a transient state. The disclosed embodiments relate to engine control technology for regulating fuel injection amount, fuel injection

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timing, ignition timing and the like to optimize torque while complying with more stringent exhaust gas regulations.

Claim 1 has been amended to clarify that the signal analysis is performed for a plurality of time-series signals, including at least one in a transient state, wherein there may be a time delay of 10 seconds or more between one time series signal and at least one other time series signal. This is an improvement of prior methods in which a steady state is achieved before correlating signals and where only shorter delay times in the millisecond range are present among the signals being analyzed. Applicants' adjustment of time series signals' time axes to a common time axis based on calculated delay times, including the long 10 second or more delay time, allows comparison analysis of mutual correlations in the transient state to be performed by a data analyzer.

Prior Art Rejections and the Cited Art

Claims 1, 4 and 6 are rejected under 35 USC 103(a) as being unpatentable over Inoue et al. (U.S. Patent No. 4,753,206) in view of Kaneyasu et al. (U.S. Patent No. 5,063,901). Claim 2 is rejected under 35 USC 103(a) as being unpatentable over Inoue et al. and Kaneyasu et al. in view of Briggs et al. (U.S. Patent No. 3,134,896). Claim 3 is rejected under 35 USC 103(a) as being unpatentable over Inoue et al. and Kaneyasu et al. in view of Rhode et al. (Review of Basic Signal Analysis). Claim 5 is rejected under 35 USC 103(a) as being

unpatentable over Inoue et al. and Kaneyasu et al. in view of Takahashi et al.

(U.S. Patent No. 5,012,422).

Inoue et al disclose a fuel injection control system for correcting a fuel

injection amount based on air intake temperature. Sensing operations are

performed by an air detecting means 1000, RPM detecting means 2000, pressure

sensor 3, throttle position sensor 5, air temperature sensor 8, water temperature

sensor 9, revolution angle sensor 11, crank angle sensor 12, and oxygen

concentration sensor 14.

The Examiner indicates that Inoue discloses at col. 5, lines 45-55 applying

a time delay of 40 seconds to a signal. Such finding is respectfully traversed.

Such passage relates to a time frame over which an average is achieved. Such 40

seconds is chosen because that is the time over which a signal PMN increases

toward signal PM. See Inoue at Figure 10a. Inoue et al. does not disclose shifting

a signal by 40 seconds so that correlation coefficients for 2 signals can be

analyzed - one signal of which is in a transient state.

Kaneyasu et al. disclose a control system for an internal combustion

engine for fine adjusting a fuel flow quantity signal and an ignition timing signal.

An air flow sensor 4, crank angle sensor 6 and oxygen sensor 5 are disclosed. The

method includes superimposing a search signal, detecting an operation state in

response to the superimposed search signal, then determining a correlation

between the detected and the search signals.

Briggs discloses an electrical signal analyzing system in which two signals are sensed and correlated. A delay is applied to one according to their correlation.

Takahashi et al. disclose a system for controlling engine fuel injection. Intake air temperature, throttle angle, crank angle, water temperature and oxygen are sensed. Figures 4 and 5 indicate that the method may be implemented while the engine exhibits a steady state.

It is respectfully submitted that none of the cited references discussed above disclose adjustment of time series signals time axes to a common time axis based on calculated delay times, including a long 10 second or more delay time, so that comparison analysis of mutual correlations in the transient state may be performed.

The Claims Distinguished

Claim 1 distinguishes over the cited art based at least upon the following claim limitations:

- wherein the plurality of time series signals comprise signals which represent an engine fuel flow rate **having a transient state**, an amount of generated torque, an engine rotation speed, and an exhaust gas amount,

- wherein the plurality of time series signals include **at least one time series signal that has at least a 10 second delay time** relative to another of the plurality of time series signals, and

- wherein the delay time calculation unit performs one of either:

  ▸ **finding a time point when a mutual correlation coefficient of each of the arbitrary two time series signals is maximum,** wherein said time point is set as the delay time, or

  ▸ **obtaining an impulse response output representing the correlation coefficient of the two time series signals,** wherein peak impulse response output is set as the delay time.

It is respectfully submitted that none of the cited references discussed above disclose adjustment of time series signals time axes to a common time axis based on calculated delay times, including a long 10 second or more delay time, so that comparison analysis of mutual correlations may be performed for signals in which at least one signal is in a transient state.

Claims 2-6 ultimately depend from claim 1 and distinguish over the cited art based at least upon the same reasons as discussed above with regard to claim 1.

Claim 6 further distinguishes over the cited art based at least upon the following claim limitations:

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- **a time axis** for a reference one signal among the plurality of time series signals **serves as a reference time axis for correlating all** other signals of the plurality of time series signals, and wherein **time delays are determined** for each of said all other time series signals **relative to said reference time axis for subsequent engine control processing.**

It is respectfully submitted that the cited art does not disclose using the time axis for one of the time series signals as a reference time axis for all the other time series signals for analyzing correlation coefficients currently and for subsequent engine control processing.

Request for Time Extension

Applicants respectfully request a one month extension of time for responding to the Office Action. The fee of $130 for the extension is provided for in the charge authorization presented in the PTO Form 2038, Credit Card Payment form, provided herewith.
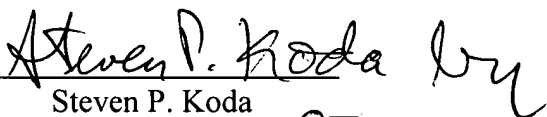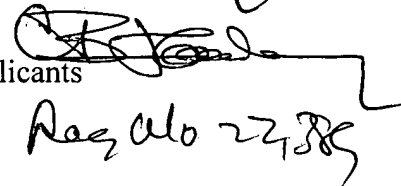
If there is any discrepancy between the fee(s) due and the fee payment authorized in the Credit Card Payment Form PTO-2038 or the Form PTO-2038 is missing or fee payment via the Form PTO-2038 cannot be processed, the USPTO is hereby authorized to charge any fee(s) or fee(s) deficiency or credit any excess payment to Deposit Account No. 10-1250.

In light of the foregoing, the application is now believed to be in proper

form for allowance of all claims and notice to that effect is earnestly solicited.

Respectfully submitted,

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